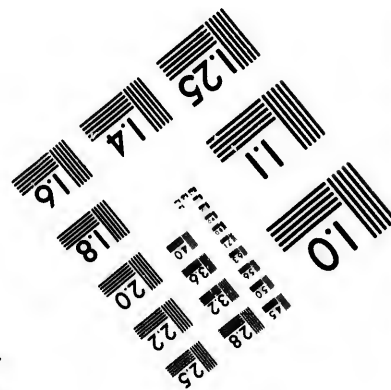
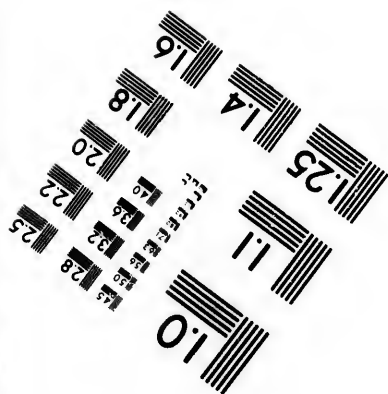
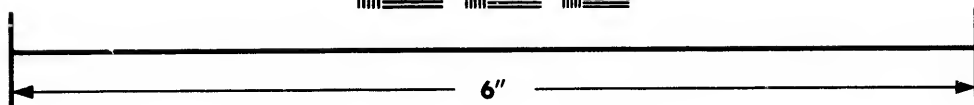
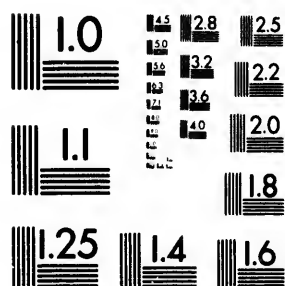


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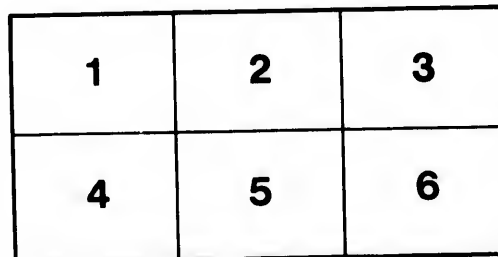
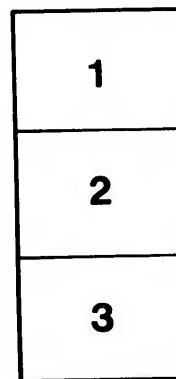
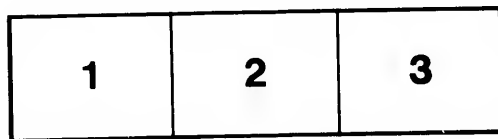
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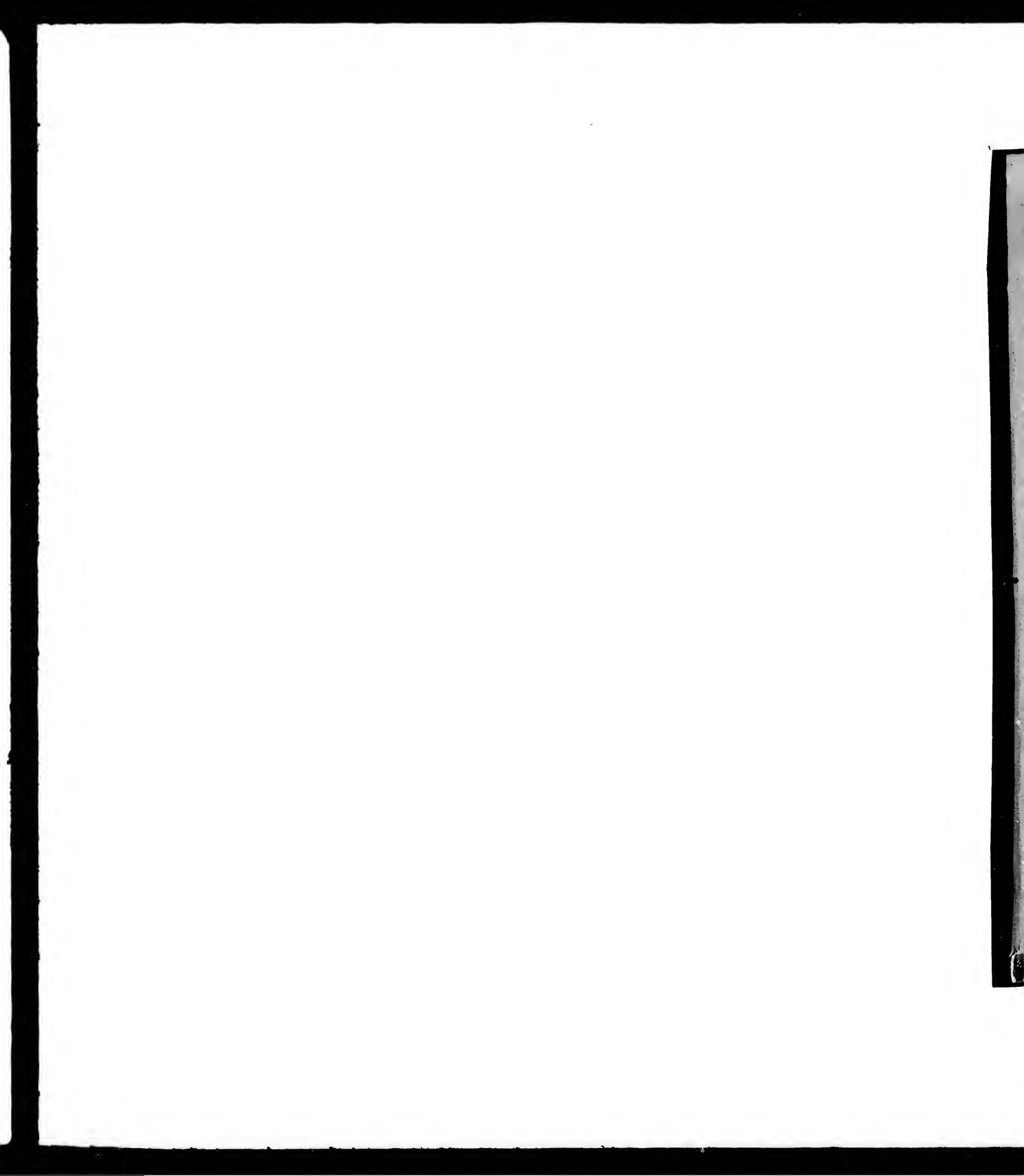
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Smithsonian Institution
From the Author

[Reprinted from the Journal of the Chemical Society, May, 1871.]

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ON A WATER FROM THE COAL MEASURES AT WEST-
VILLE, NOVA SCOTIA.

By Professor ^{Henry} How, D.C.L., University of King's College, Windsor, N.S.

In a paper published in the Journal of the Chemical Society for May 1870, I described an acid water from the Acadia Coal Mines at Stellarton, Pictou county, N.S. The subject of the present communication was obtained from a neighbouring mine in the same county, the Black Diamond Colliery, situated at Westville, a new village about two miles west of the former place. This water differs from that obtained at Stellarton, which was partly of surface origin, in having been taken from a coal pit, and while the former furnished a good illustration of the evils attending the use of such a water in boilers, this gives an opportunity of comparing a water from the productive coal measures with those arising under different geological conditions. In 1865, I described to the Society* a dense brine from Salt-springs, Pictou county, which, though containing more salt than the others, as yet ascertained, probably shows the general character of the brines issuing from the lower carboniferous and gypsiferous districts of this province, since it agrees with another of them, from Walton, a distant locality, as I have shown,† in containing sulphate of calcium as the most abundant ingredient after chloride of sodium, and smaller quantities of chloride and carbonate of magnesium and calcium, though the amounts of these are not alike, either absolutely or relatively. There are other waters arising in these gypsiferous districts in which sulphates are the chief constituents, chlorides being nearly absent. For example, the Spa Spring water of Windsor, Hants county, contained, when I analysed it in 1858, solid matter to the amount of 138 grains in the imperial gallon, of which about 106 were sulphate of calcium, 12 consisted of sulphates of magnesium, sodium and potassium, and only 0.9 of any chloride, that

* Journal of the Chemical Society, xviii, 44.

† Transactions N.S. Institute, 1865, and Mineralogy of N.S., p. 143.

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of sodium.* These eminently sulphated waters present interesting contrasts with those in which chlorides are by much the preponderating constituents, as the saline water of Bras d'Or, Cape Breton, analysed by myself,† the brines of Onondaga, New York, examined by Professor Gössmann,‡ several others described by Dr. Hunt,§ and the Wheel Clifford water analysed by Professor W. A. Miller,|| and also with the Kissingen water at Harrogate, examined by Dr. S. Muspratt,¶ and those described by Dr. Hunt,** in which chlorides are abundant and sulphates are absent. All these waters, excepting that from Harrogate, which is from rocks at the junction of the permian with the carboniferous, issue from systems older than the carboniferous; and we see the same features presented by waters of intermediate times: for the brines of the valley of the Alleghany River, obtained from borings in the coal formation, are remarkable for containing large proportions of chlorides of calcium and magnesium, though the sum of these is never equal to more than about one-fourth of the chloride of sodium. The presence of salts of barium and strontium in these brines, and the consequent absence of sulphates, is, according to Lenny, a constant character in this region over an area of two thousand square miles.†† In this curious circumstance, these waters agree with the Kissingen water, and several of the Canadian waters described by Dr. Hunt.‡‡

The water now to be described was mentioned as having been taken from the productive coal measures. These constitute the middle coal formation or the coal measures proper of this province, according to the arrangement of Dr. Dawson, who says that this series includes the productive beds of coal, and is destitute of true marine limestones. Beds tinged with peroxide of iron, are less common in this formation than in any of the others of the system. Dark-coloured shales and grey sandstones prevail, and there are no conglomerates.§§ These beds are separated from the gypsiferous group before referred to by the underlying millstone grit series, and they represent the lower coal measures of the United States, and in part, the coal formation of Britain.

Two samples of water were taken from the same pit at the Black Diamond Colliery, under somewhat different circumstances, and sent to me for examination in November 1870, by A. W. Greig Esq., superintendent of the Nova Scotia Coal Company, who was desirous of ascertaining whether the water would answer for use in his boilers.

* Chem. News, ix, 98.

† Chem. News, ix, 97.

‡ Silliman's Journal, July, 1867.

§ Geology of Canada, 1863, p. 53; and Contributions to the Chemistry of Waters, Silliman's Journal, 1865.

|| Chem. News, x, 181.

¶ Chem. News, xiv, 49, and xv, 245.

** Loc. cit.

†† Bischof, Chemical Geology, i, 377.

‡‡ Loc. cit.

§§ Acadian Geology, Second Edition, p. 130.

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ASURES

AT WESTVILLE, NOVA SCOTIA.

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The waters were bright and clear; they had no odour; their taste was that of good spring water. They gave respectively the following results:—

	Grains in the imperial gallon.	
	No. 1.	No. 2.
Silica	0.63	0.46
Carbonate of calcium	11.55	10.59
Carbonate of magnesium	3.67	3.57
Carbonate of iron	traces	traces
Chloride of sodium	0.84	1.17
Sulphate of potassium	1.14	1.58
Sulphate of sodium	4.17	2.50
Phosphoric acid	none	none
Organic matter	none	traces
Carbonate of sodium	3.55	3.35
	25.55	23.22
Free carbonic acid.....	undet.	undet.
Specific gravity.....	1000.459	1000.339

Hence it appears that the waters were essentially the same; they had an acid reaction on litmus; the paper regained its blue colour on drying; they gave off a good deal of carbonic acid gas, and deposited carbonates of calcium and magnesium on boiling; nearly all the former was thrown down after two or three hours' boiling, and on concentration, a mere trace remained dissolved. The waters soon acquired an alkaline reaction on evaporation; and when concentrated, they coloured turmeric deep brown, effervesced with acids, and contained sulphates, alkalis, and a notable quantity of magnesia.

The waters being one and the same, may be spoken of as the water from Westville, and, of course, in reference to the condition after loss of the carbonic acid, which renders the carbonates present bicarbonates, as an alkaline water. It is interesting to find the composition of this water so totally unlike that of any of the waters of this province as yet analysed, though this was to be expected considering the different geological conditions under which those which have been examined arise. The small quantity of chlorides may have some relation to the absence of marine limestones in the productive measures mentioned by Dr. Dawson, and is in very strong contrast with that in the brines from the coal-formation of the Alleghany River district referred to above. In the waters containing carbonate of sodium analysed by Dr. Hunt, which form his fourth class,* chlorides are sometimes absolutely and relatively more abundant than in this case; but on the whole, this is the class to which the Westville or Black Diamond Colliery water belongs.

* Loc. cit.

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News, ix, 97.

The Chemistry of Waters,
News, x, 181.

†† Loc. cit.
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